Monograph On Question Banking For Universities

ASSOCIATION OF INDIAN UNIVERSITIES

Monograph On Question Banking For Universities

RESEARCH CELL
ASSOCIATION OF INDIAN UNIVERSITIES
NEW DELHI

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Reprinted : 1991

Price Rs. 14.00

Published by the Association of Indian Universities, AIU House,
16, Kotla Marg, New Delhi - 110002 and Printed at Dee Kay Printers,
Kirti Nagar Indl. Area, New Delhi - 110015.

FOREWORD

In addition to the Question Bank series, the Association has also sponsored a few research studies. The results of these researches are being embodied in a series of monographs. As visualised at present the following topics are being covered:

1. Grading.
2. Question Banking for Universities.
3. Internal Assessment.
4. Practical Examinations.
5. Test and Item Analysis.

The Monograph on Grading was released last year and has been reprinted in its third revised edition just now. The Monograph on Question Banking for Universities is presented herewith. In a sense, this monograph acts as a curtain raiser to the series on Question Banking which is being published separately. This monograph sets out the theory of question banking, its uses in university examinations, levels and forms of question banking, storing of questions retrieving them, Pre-validating them, post-validating them and a whole host of related issues. As workshops and seminars are being organised and will continue to be organised in colleges and universities all over the country, this monograph would be found particularly useful, indeed indispensable.

Since there still prevails some confusion with regard to the objectives behind question banking, it seems necessary to repeat that question banking is by no means an attempt to short circuit the process of learning. On the contrary, it is a pedagogic device to regulate and quicken the process of learning. Indeed to participate in the task of setting questions is itself an educative process. This was the experience of bund teachers who have participated in the more than 20 wo organised by the Association in different parts of the To be able to ask the right kind of questions requires a thorough understanding of the subject matter. That is why the teachers found that participation in these workshops helped to deepen their understanding of the subject. Since the educational process is the same, whether for the teachers or the taught, there is every reason to believe that the students also would profit from it as much as the teachers.

The Monograph on Internal Assessment is also ready and will be available within the next few weeks. The other monographs are under preparation and are expected to be ready within the next few months.

We are confident that each one of these monographs would be found useful by the community of teachers and students.

New Delhi,
January 8, 1977.

Amrik Singh
Secretary
Association of Indian Universities.

PREFACE

Many educationally developed countries have been for sometime carrying out, at all levels of education, a systematic collection of a bank or pool of items and questions for use. In India the NCERT started developing pools of questions/items for school examinations. The Association of Indian Universities (then Inter-University Board) during a Seminar on "Examinations in Higher Education" conducted in January 1971 recommended question banking as a major plank of examination reform. In ' Examination Reform- A Plan of Action' the UGC also suggested question banking as part of examination reform for universities.

The Association of Indian Universities accordingly undertook Question Banking as a development project and has so far successfully built up initial question banks in 10 subjects i. e. Mathematics, Physics, Chemistry, Botany, Zoology, History, Geography, Psychology, Economics and Commerce at the first degree level. Nearly 60,000 questions/items in these subjects are available in specially designed cards in Cardex trays. It is also proposed to print Question Bank Books in these subjects making available a set of prevalidated questions/items of all types in all the areas of these subjects. Three main sources from which questions/items were collected included:

a) from specially conducted Question Banking Workshops in various universities/colleges for periods ranging from 3 days to 10 days where teachers were inducted into the science of question making. Nearly 50 to 60 teachers in every subject were involved. Questions/items made during these workshops account for 30 to 40% of the total.

b) from teachers and item writers from all over the country. Care was also taken to select around 20 teachers/ subject who were trained in evaluation through workshops conducted in the past. Nearly 40% of total questions/items in any bank is composed of this.

c) from past examination papers of universities. Most of the questions/items were repeated stereotyped and vaguely worded and in effect did not satisfy the criteria for quality. Hence, from this source, it was not possible to have more than 15 to 20% of total questions/items in each subject.

These questions/items were prevalidated with a checklist of criteria for good quality questions/items and provided with basic technical values like a) coding (Bibliographic); b) subject/topic; c) type of question; d) objective tested; e) time for answering and f) marks allotted.

Thus a bank of items/questions of known technical values has been built up for future use. It might, in practice, prove of value to arrange for item construction to be a more or less continuous process. The construction of written papers can then become a matter of judging the suitability of items of known technical values from a bank of items. Items can be weeded out as ' out of date' over a period of time. These banks would have to be large to be of ' value' . In fact , these banks would be not just material for terminal evaluation but also for continuous assessment and individualised examining.

A Monograph detailing fundamental principles, outcomes and uses of Question Bank to enable universities to launch upon building initial question banks in various subjects is being brought out. Monographs are usually intended:

a) to share the ideas with other researchers concerned to generate more thinking in this area;

b) to acquaint educational workers such as educational administrators, curriculum planners and teacher educators with the tentative findings of the explorative study;

c) to obtain, if possible, their comments and criticisms for the benefit of the project.

It is hoped that educational administrators, teachers and others connected with university examinations will find this Monograph useful. Constructive suggestions in regard to its improvement for future editions will be most welcome .

New Delhi,
January 8 , 1977

V. Natarajan
Project Officer (Exams.)

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QUESTION BANKS-USES IN INDIAN UNIVERSITY EXAMINATIONS

1.0 INTRODUCTION

Like fume-free cars and the Kingdom of Heaven, question banking is one of those ideas which has great appeal but which people do little about. In that respect, the position is little changed from 1971 when the Association of Indian Universities recommended strongly that the University Boards of Studies should ' frame' not only syllabus but also a ' Bank of questions' for each of the courses. Many universities have since tried to expand their syllabi in various subjects into meaningful objectives and produced resource materials for students and teachers including evaluation materials. This is in keeping with the Report of the Education Commission (1964-66 p. 220) where it is said ' examination reform has become crucial to all progress and has to go hand in hand with the improvements in teaching'. The Radhakrishnan Commission said, ' if we are to suggest a single reform in University Education, it is that of examination reform'. Dr. Amrik Singh strongly feels that priority should be given to improvements in teaching in universites and that it is wrong to suppose that changes in examinations will automatically produce desirable changes in university teaching. It is wise however to effect changes in both teaching and testing. Question banking is one of the strongest ideas that will attempt to integrate teaching and testing at both individual university's level and amongst various universities of the country. Some universities[1] have gone ahead with Question Banking and many others[2] are on their way to implement Question Banking as a part of examination reform. At the same time a good number of universities is still either undecided or unaware of the potentialities of Question Banking. While individual universities/institutions should be given encouragement

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1. Universities of Calicut, Poona, Rajasthan.
2. Universities of Madras, Madurai, Mysore, Bombay.

and assistance in the matter of Question Banking, a need to create an initial Question Bank in major first degree level subjects useful for all universities in the country was strongly felt in terms of saving of time, effort and resource and also in terms of bringing about uniformity and standardisations of some kind. The Association of Indian Universities, in its Research Unit on Examinations, has taken it up as a major development activity, constituting initial Question Banks in First degree level subjects of Mathematics, Physics, Chemistry, Botany, Zoology, History, Geography, Psychology, Economics and Commerce. In all, there are about 60,000 questions/items in these 10 subjects and these have been prevalidated, coded, classified and stored in the form of 8" x 5" cords in Kardex trays. Question banks, making full use of the accumulated experience of teachers and examiners, represent an important potential contribution to the process of examining. In our country, the last decade or so has seen a marked desire for improvement in examining, perhaps characterized chiefly by the evolution of improved school examinations by NCERT and other agencies in the various states and research into and concern for increased technical efficiency. The need at this time to consider and discuss such possible innovations as question banks is particularly strong in view of the increasing load which the existing pattern of examining must bear. The need is caused by rising numbers taking various examinations, widening range of examinable subject matter, the need for more frequent revision of syllabi, the breaking down of traditional subject boundaries, the movement towards a greater degree of involvement by teachers in the examining process and the continuing use of examinations for course evaluation, pupil diagnosis, educational guidance and selection.

At the same time the demands to examine with justice and to maintain and improve standards are as strong as they have ever been and may well become stronger as a larger proportion of the population comes to be directly affected by examinations. Therefore, the task of examining which already involves considerable educational and administrative effort will inevitably become more difficult and complicated in the years ahead. All this adds vigour and point to the search for improved methods of examining and compels careful consideration of the role of " question banks".

The main objective of this monograph is to propose a plan of action to build up Question Banks in our country through co-ordination of different organisations and universities avoiding duplication of efforts, piecemeal work and adhoc decisions of subjects. Some practical ways of building up and using Question Banks in the present context and thus maintain their dynamic concept are suggested.

2.0 WHAT IS A QUESTION BANK

There is nothing revolutionary in the idea of a Question Bank. Stores or banks of questions have been in existence for a long time. Over the years, various universities, and examining boards have produced a large number of questions in many different subject areas; these in effect constitute a series of banks from which questions are drawn for examining purposes and to which new questions are added from time to time. Similarly most teachers have developed their own questions for assessing the progress oftheir students. Teachers and examiners will be familiar, of course, with the task of drawing up suitable questions for purposes of assessment and teaching. Most of these questions were set largely on an intuitive basis because they looked "right" or bacause they seemed to work. In the hands of an experienced teacher or examiner this process has generated a considerable store of questions that time has shown to be of merit. But such teachers and examiners have been few in number so that the less experienced have not had the same opportunity to develop this kind of judgement on the questions they devise and select.

Question bank in the sense used in this monograph contains questions about which there is available some specific information, usually of a statistical nature. In this sense they differ from question banks already built up by teachers and examiners. The main function of a Question Bank, if one were established would be to make available to teachers and examining bodies such questions together with associated information that they might wish to use in preparing their own tests and examinations during or at the end of a course. Individual questions would be selected on the basis of experience gained in using the questions " in the field". Another task of a question bank would be to help provide an estimate of the degree of comparability of examinations produced in this way.

The process of producing questions for a question bank might well result in a clarification of the aims and objectives of the examinations. This could lead to the specification of subject objectives in fairly precise and detailed terms. It would be a mistake to suppose, however, that a Question Bank would consist solely of those questions in which the course objectives can be accurately defined and measured. This would be a narrow interpretation of the way a Question Bank would work. A Question Bank could clearly be composed of all kinds of questions now being used for internal and external assessment, ranging from the " open" or " essay type" to the " closed" or "objective" type questions. It is necessary that a question bank must contain a large number of questions/items in a particular subject. Going beyond written questions/items there is no reason why other kinds of tasks such as oral questions, dictation, musical passages, project topics and practical experiments should not be stored provided that some quantitative evaluation of them will be made. Perhaps 'Question Bank' is itself too restrictive a description of the enterprise, may be ' task' or' stimulus' Bank is more appropriate a shift in emphasis which brings the conception very close indeed to two other kinds of educational bank bruited recently, " a resource bank" and " a syllabus bank."

The Examination Bulletin 3[1] describes the Question Banks as follows:

> "A BANK OF ITEMS (QUESTIONS) OF KNOWN TECHNICAL VALUES CAN BE BUILT UP FOR FUTURE USE. IT MIGHT, IN PRACTICE, PROVE OF VALUE TO ARRANGE FOR ITEM CONSTRUCTION TO BE A MORE OR LESS CONTINUOUS PROCESS. THE CONSTRUCTION OF WRITTEN PAPERS CAN THEN BECOME A MATTER OF JUDGING THE SUITABILITY OF ITEMS OF KNOWN TECHNICAL VALUE FROM A BANK OF ITEMS. ITEMS CAN BE WEEDED OUT AS OUT OF DATE OVER A PERIOD OF TIME. FURTHER IT CAN BE SAID THAT NEW QUESTIONS SHOULD BE TRIED OUT AND STATISICAL EVIDENCES FOR ITS FACILITY,DISCRIMINATION ASCERTAINED, IT IS ABSOLUTELY NECESSARY THAT THE BANKS WOULD HAVE TO BE LARGE TO BE OF VALUE."

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[1] Examination Bulletin 3"Use: An introduction to some techniques of Examining", HMSO , 1964.

3.0 WHAT CAN A QUESTION BANK OFFER

A question bank allows careful pretesting of questions from which advance information could be made available to examination boards; such information being of a statistical nature , sometimes accompanied by a description of the learning objective that the question was intended to measure This description helps to decide retention, improvement or rejection of questions. The data would complement the judgment of examiners and teachers and not in any way supplant their necessary freedom to select their own questions. The practice of pretesting questions with representative samples would mean that teacher could compare the performances of his own students with those of the wider population, thus contributing to the overall maintenance of national standards. A carefully built up Question Bank can influence curriculum development. In building up a bank of questions some re-appraisal of what these questions were intended to reveal in terms of pupil learning might become necessary. A Question Bank could be composed then, in part at least, of questions produced to fit this specification of objectives. Each question would be related to a particular objective of learning and would therefore play a small but vital part in measuring the total achievements of the individual.

The potential advantages are thus obvious. A Question Bank offers the chance (a) to produce and evaluate question on a relatively more effective basis; (b) to carry out concurrent comparability; (c) to match the examinations to the curriculum that is taught and not as tends to happen in the conventional setting the other way round. The Question Bank would act as a neutral educational and administrative service helping teachers and examiners to solve some of the problems with large-scale examining.

4.0 HOW MAY A QUESTION BANK WORK?

The workability of Question Bank may depend on scope, scale of operations, the relationship with examining bodies and colleges and universites, financing and administration.

There are many possibilities of organising question banks in practice. It is proposed to give guidance regarding the various ways in which questions might be developed and used in a Question Bank.

Universities that are selected to implement examination reform are to work in a coordinated way and help each other where possible.

There are two possible procedures that suggest themselves. The first procedure would involve the use of questions and items already in existence which examiners and teachers considered to satisfy their criterion of " good " questions. These might be specific questions or they may be objective type questions.

The second procedure would require that questions were developed to measure as precisely as possible those objectives of learning that teachers and examiners considered important. Such questions/items would normally be devised at the end of a period during which some detailed reapprisal of learning objectives had been undertaken, the aim being to relate the questions to the specified objectives to build in validity. In an affiliating type of university, teachers drawn from different colleges teaching subjects at the same level are to be given a short orientation into areas of objectives, strengths and weaknesses of different types of items and questions and initiated into the scientific skill of item writing. An initial attempt may be spread over a period of 3 weeks in a workshop type course.

Initially, one may tend to use the first procedure which is a good starting point. However, the second procedure ensures that questions and items satisfy validity and it may well generate and train a number of teachers as item writers. Whatever procedure is adopted (a combination of the two, is however advocated) , certain features are common. a) Question/items must be tried out in the " field " or " pretested" in order to obtain statistical data about how the questions/items behave with a sample. on the basis of the statistics, such questions/items must also be retained, modified or rejected. b) Questions/items must also be tried under actual examination conditions.

In this case the decisions about questions would be made after the event and not before as in the case of pretesting. But this may be valuable to yield operational characteristics of questions supplementing information from pretesting.

One may suggest writing out on cards (designed for the purpose) the questions to constitute the Bank and stored. An 8"x5" size card is ideal for storing in Kardex trays. Punched cards may be used and items/questions stored in computer. It may also be published as a " brochure", each question with related statistical information, the learning objective tested etc. Guidelines may be given in the matter of selecting questions from the brochure or from cards or from the computer. A question paper may be made with questions from the bank to which some others may also be added. The items/questions that are drawn from the bank are to be analysed statistically and the data entered in appropriate columns in the cards. Items which are of objective type , when they constitute a test, may be marked and graded with the use of a digital computer. A computer programme has been developed that will mark the answer scripts of a test with objective type test items (Multiple choice) and make statistical analysis as well.

It would be difficult to imagine a Question Bank developing it full potential without making use of the technical and administrative advantages of a computer. The handling of large scale computations, the drawing of samples, the storage and retrieval of questions and related data argue the case for a computer. A question bank could however operate on a more limited scale, without being based on computer technology.

For the use of teachers to make classroom tests (continuous assessment) a brochure type bank of items that are to be pretested may be preferred. As the items/questions which are found to satisfy the criterion of facility, discrimination, difficulty level, could be made into a bank of questions for the examiners to use in making "end of term" university examinations.

5.0 CAN A QUESTION BANK BE USED FOR ALL SUBJECTS

Although the actual logistics of operating a question bank for sample pretesting and statistical analysis might appear alike in most subjects, certain subjects probably lend themselves more readily to the concept of question banking than others. Mathematics, biology, physics, strength of materials, electronics, might be thought more amenable to a detailed analysis of learning objectives than history, modern languages, psychology, human geography. It is very difficult to spell objectivies in the latter subjects while it is very easy to do s in respect of the former. Teachers may think that question banking suits those subject areas in which it is thought easier to express questions in objective form. One might think that a question bank has very little to offer about subjects in which objectives are predominantly oral and skill-oriented though there is no logical reason why tape-recordings, scale exercises, prose passages, and the like should not be stored in a question bank. There are difficulties in applying an uniform concept of question banking to all subjects, though writing objectives is not a necessary precondition. Questions could still be used pretested, analysed statistically in situations where objectives had not clearly been stated. Objective type examination has the advantage in the sense that accurate statistical analysis can be made. Essay type, problem type questions can also be used in the question bank even though statistical analysis in such cases tends to be crude.

6.0 CAN A QUESTION BANK MEET LOCAL NEEDS

In a few subjects like geography and history, it may be necessary to adopt questions to local needs. Questions in these subjects may be classified as a) those that are of universal significance, b) those that use local place-names to illustrate a situation but could be adopted for universal use and c) those that are not amenable to adoption in any way. It is wise to keep the percentage of questions in (b) and (c) to a minimum. The idea is that question bank can be used by many universities and that each univerity can work in a few predetermined areas or subjects so that duplication of efforts can be avoided. The time, money and effort that goes into scientific production of questions for bank in a country like ours necessitates such coordinated ways to do the job. It is also healthy to exchange the banks in different subjects from different universities. Such coordination and cooperation among the selected universities is strongly recommended so that these universities with the least expenditure of time, money and effort can produce and create item banks in different common subjects on a sharing basis. The Association of Indian Universties, with its Research Cell, is now quite willing to bring about this coordination and help produce a Central Bank of questions/items in first degree subjects for use by all Indian Universities.

7.0 STATISTICAL PROCEDURES

It is proposed to give an outline of more basic calculations that may be used in the operation of a question bank. More advanced techniques have been developed and it is probable that some modified form of these would be used in the operation of every large scale question bank. The main statistical technique is known as item analysis. In performing item analysis two main values are computed: (1) Facility Value (F.V.) and (2) Discrimination Index (D.I). The first indicates the difficulty level of the question (whether it is hard or easy) and the second indicates the extent to which the question discriminates between good and poor candidates. A conventional item analysis is as follows:

(a) Place all the completed scripts in order of merit of marks on the whole paper. Divide them into equal portions. Sixths or fifths are commonly used.

(b) Take each candidate, paper and for each question in turn, count the number of candidates who gave each of the four/five possible answers in each of the sixths. (This is a multiple choice question with 4/5 possible answers). Thus all the responses are included in the analysis. This is useful because it may be possible to see whether a particular answer is attracting too many responses and acting as what test constructors call a " distractor."

(c) A grid can then be completed, Suppose B is the correct answer.

Answer	A	B	C	D	E	Total	P6	P3
Top sixth	1	12	1	3	1	18	0.67	0.47
2nd sixth	2	8	2	3	2	17	0.47	
3rd sixth	1	9	3	1	4	18	0.50	
4th sixth	2	9	3	3	1	18	0.50	
5th sixth	3	4	4	1	5	17	0.24	0.14
Botom sixth	5	1	3	4	5	18	0.06	
Total	14	43	16	15	18	106	0.41	

P6 proportion of total number of candidates in each sixth who obtained the correct answer.

P3 proportion of total number of candidates in each theird who obtained the correct answer.

(d) The grid shows 43 out of 106 answered the question correctly. Thus the question has a facility value of $\frac{43}{106} \times 100 = 41\%$. This is on the low side for an attainment examination.

(e) The D.I. value is computed in many ways. It is obtained by (i) subtracting the F.V. of lower third from the F.V. of upper third.
(ii) subtracting the F.V. of lower ability group from the F.V. of the higher group (Top 27% of population)
Lower ability group= Bottom 27%.....

(f) Based on thirds, D.I. of this item= 0.57-0.14=0.43 Ideally we would aim to have a D.I. value around 0.8. In practice, lower D.I. values of around 0.6 are acceptable .

The value of these statistics lies in their capacity to identify unsatisfactory questions. A high F.V. means low D.I. Low D.I. may be also due to low F.V. This means that the item is too easy (former case) or too hard (later case) to be able to discriminate good from bad ones. A question may be confusing or ambiguous. As a rule, the distractors must be accounting for a greater number of lower ability group than higher ability group. An option that is not the correct answer should negatively discriminate.

When one is attempting to sample a defined body of content as in a subject examination, it is usually undesirable to drop questions just because their FV. and D.I. values are low. Most examiners will tolerate low value on the grounds that these will contribute to better sampling and enable high content validity to be secured. Generally speaking, high D.I. values are required when it is necessary to distinguish different levels of achievement (Selection) . Where however the examination is designed to provide feedback information for the purpose of course evaluation, a high D.I. value is of less importance.

One important point that is to be borne in mind is the difference in statistics that would arise for pretesting and actual examination conditions since it will be very difficult to get a representative sample.

8.0 COMPARABILITY & MAINTENANCE OF STANDARDS

Careful pretesting of questions on representative samples of the relevant population would be intrinsic to the operation of a question bank. Each question tested in this way would have a wide national significance and would be used by teachers and examiners as a basis for comparision between their own candidates and those of the pretest sample. Teachers would compare the item statistics calculated for their own group of students against those for the pretest sample. In this way the question bank can provide evidence to teachers about the performances of their students relative to others following similar courses and would thereby help to maintain standards at a reasonably constant level. The proportions of the pretest sample in each grade band who correctly answered the various questions would be known. This can help to predict their grades in the examination reasonably correctly.

9.0 TYPES OF QUESTION BANKS

The types can range from a collection of past examination papers of a university or class test items of a teacher to the most sophisticated stored items/questions in the computer. (1) A collection of items/questions published in the form of a booklet/brochure may be made available together with those prepared by a group of teachers after analysing objectives of learning various content areas. Initially this may be used for pretesting and collecting statistical evidences. (2) Once a reasonable statistics is obtained, each item/question is looked at critically and retained, improved or rejected. Those that are improved and retained will be transferred on to cards especially designed for the purpose for use by examiners to set end of term or university examinations. (3) Those items/questions that are retained can also be stored in the memory of a digital computer. Whatever type is chosen, the dynamic concept of question banking must be kept up.

10.0 FUTURE OF QUESTION BANKS

This explains the concept of a question bank, to describe how it might work and to explore some of the issues involved. It is hoped that this would be discussed by every University/Examination Board/Institution trying to build up question banks in our country and evolve methods that would be feasible, taking into account local conditions and constraints. Evidence collected on the operation of Question banks in the next few years will certainly add another dimension to modern examining procedures in our country.

SECTION II

QUESTION BANKING - OUTCOMES

QUESTION BANKING - OUTCOMES

It is indeed necessary for us to look at some of the possible outcomes of Question Banks. Outcomes are very many and they depend on how teachers, students, administrators and universities use the question banks. As outlined earlier, the Question Bank consists of a large number of different types of questions/items in every subject, with known technical values.

Some technical values of a question/item are :

i) The content area/topic with which it is concerned.

ii) The intellectual ability that the question/item demands of the student. It may be knowledge, comprehension, application, analysis, synthesis or evaluation.

iii) The time required for answering.

iv) The type of question/item whether selection or supply.

v) Marks allotted.

vi) Facility value or difficulty index

vii) Discrimination index.

1. The most important outcome is the availability of a large number of questions/items in both selection and supply types. Selection type includes :

    a) constant alternative T/F

    b) multiple choice

    c) multiple facet

d) matching (simple and compound)

e) rearrangement

and supply type includes :

a) simple question

b) completion

c) short answer question

d) long answer question

e) problem solving

When the questions/items are carefully selected from sources of

1) specially conducted Question Banking Workshops

2) item writers/teachers and

3) past examinations

it is very likely that they can be made to measure important abilities in a content area and for various content areas. In Question Banking Workshops, it will be possible to clarify outcomes of learning a content area and expose to valid ways of testing the achievement of these objectives of learning systematically so much so that questions/items generated from these workshops will be of very good quality. A good number of teachers have already been trained in the science of item writing and they are also involved. Such questions/items are prevalidated with a checklist of criteria for good quality questions/items and some technical values namely (i) to (v) above are incorporated.

Teachers in colleges/universities teaching these subjects are now helped with a collection of questions/items prevalidated and they can initially use them for class tests. Various universities can use these questions/items for the end of semester or year examinations.

Teachers can analyse the responses of students and begin to undertake the professional tasks of test and item analysis and work out facility value and discrimination index of these and make inferences about teaching, student's learning etc.

II. Teachers and examiners will spend very little time in making up class tests and university examinations and spend the time thus saved in analysing responses and improvement of questions/items. Every department in a college can arrange to store items/questions in specially designed 8"x5" cards and store them in Kardex trays. The Controller's office can adopt a similar procedure or even store these questions/items in the memory of a digital computer. There can be a considerable saving of time and effort in making up question papers. If the initial questions/items bank is fairly large, (atleast 20 to 30 times the number of questions in a single paper) then the choice of questions/items is meaningful.

III. Teachers and examiners will be continuously involved in creating more and more items for inclusion, thus keeping themselves professionally involved.

IV. There can be a backwash effect on teaching. The nature of questions/items being so varied, will impose innovative methods of efficient teaching and effective learning.

V. Question banks offer to carry out concurrent comparability. The same items/questions at the same level returning the same statistics of FV and DI in different universities will ensure comparability of standards. A third university that returns very poor FV and DI for the same items, can be rightly said to have low standards. It is thus possible to provide a definition of standards and question banks if carefully designed and operated, will help maintain 'standards'.

VI. Question Banks if carefully built up can influence curricular development. A meaningful way of interpreting syllabus, writing objectives, building valid questions/items are some of the possible gains.

VII. This may well generate a number of teachers as item writers. They will develop scientific skills not only in item writing but also in prevalidating them.

VIII. If FV and DI are known for all items/questions, teachers can use Question Bank for making diagnostic tests, mastery tests and criterion referenced tests etc.

IX. Careful pretesting of questions on representative samples of the relevant population would be intrinsic to the operation of question bank. Each question tested in this way would have a wide national significance and would be used by teachers and examiners as a basis for comparison between their own candidates and those of the pretested sample. Teachers would compare the item statistics calculated for their own groups of students against those from the pretested sample. In this way, the Question Bank can provide evidence to teachers about the performance of their students relative to others following similar courses thereby helping to maintain standards at a reasonably constant level. The proportions of the pretest sample in each grade band who correctly answered the various questions would be known. This can help to predict their grades in the examination reasonably correctly.

Teachers, examiners and Boards of Studies members will be quite prepared to restructure their question papers in various subjects including more and more of objective and structured short answer questions, thereby ensuring increased content validity and overall reliability of their examinations. It is very likely that written papers in various subjects may be made up of a Part A *objective (20 to 30 items for $\frac{1}{2}$ hour) Part B short* answer structured questions (10 to 15 questions for 2 hours) and Part C long answer/problem solving questions (1 to 2 questions for $\frac{1}{2}$ hour).

SECTION III

LEVELS AND FORMS OF QUESTION BANKS

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The basic idea behind question banking could hardly be simpler. A library of questions/items of all descriptions is put at the disposal of teachers and examiners wishing to set either terminal examinations or periodical classroom tests or in the case of examining boards written, external semester or yearly examinations. Undoubtedly the uses to which banks of questions/items can be put will determine the level and form of them. There can be many criteria for classification into levels while the forms are usually dictated by the manner in which questions/items are collected and stored. It is necessary for teachers, examiners and administrators to know clearly the different levels and forms of question banks, (in different subjects, for universities) will take, in order to be able to realistically use them. In fact, there is more to question banks than first meets the eye; it can be at the simplest level, a collection of questions/items from different sources while at its most complex, a set of prevalidated, coded items/questions of known technical statistical values (FV & DI) stored in the memory of a digital computer capable of being retrieved.

One way of classification is to base it on the level of sophistication. This may be Level Zero. A simple collection of questions/items of all kinds ranging from selection to supply from different sources and put into a file. At this level, the question bank has very little to offer except that there is a collection of questions/items. Not even an attempt to relate the questions/items with the syllabus, is now made.

Level One

At this level, it is not a collection of questions/items only. They are reviewed by a group of teachers who pass judgment about the questions/items with the help of a checklist of criteria for prevalidation along with an expert on evaluation. Questions from different sources like

1) specially conducted question banking workshops;
2) teachers/item writers who had been trained in evaluation methods;
3) past examination papers

are prevalidated and technical values about the questions/ items are given.

Level Two

At this level, there is the further provision that they are stored in cards (8" x 5") specially designed to contain one question or one item per card along with technical values. In addition there are columns for entering FV & DI of the questions/items after use. After a period of time there will be available questions/items with technical values and characteristics like FV & DI for use by paper setters and teachers. A card designed for initial question banks set up by AIU is given at the end of this section.

Level Three

At this level, it must include all that is included at Level Two together with the provision that these questions/ items are coded and stored in the memory of a digital computer. It must be possible to retrieve any question/ item and a series of them to constitute a class test or a university examination. One main advantage is that if we are thinking of obtaining different forms of the same objective type test items to ensure that all students taking the examination, answer the same items arranged in different ways so that they cannot communicate with each other, it is possible through the use of the computer.

The question arises as to what must be the proper level at which question bank must be planned and set up in an individual university. Level Three must be the level at which an individual university, having an examination unit and potential of using computers in examinations must start , Question Bank. Alternatively, the university can attempt at Level Two with the provision to update it to Level Three at a future date.

There could be yet another basis for classification. This may be Level A. An individual member of staff teaching a particular course, collects a good number of questions/items of all types (selection consisting of constant alternatives, multiple choice, multiple facet, rearrangement and matching and supply type consisting of completion, simple question, short answer, long answer and problem solving) for use in class tests. He may try to make on his own, a few questions/items to match instructional objectives already written by him. He can also undertake systematic item analysis and find out FV & DI of all the items/questions. He may use it to improve his own teaching and also to diagnose weaknesses of learning.

Level B A department in a college with all its staff constitutes initial question banks in their subjects collecting questions/items from 1) past examination papers;2) the staff of the department and 3) specially conducted workshops to produce requisite number of items/questions. The group would prevalidate these questions/items with a checklist of criteria and perhaps store the questions/items on cards (8" x 5") in Kardex trays. They may undertake to do item analysis.

Level C At this level, a university builds up a question bank with the help of teachers from various affiliated colleges coming together. This may be done

a) by collecting questions/items from different sources that of past examinations, teachers, item writers and participants in specially conducted question banking workshops;

b) by prevalidating questions/items with the help of a checklist and by groups of teachers;
c) by storing them on 8" x 5" cards in Kardex trays.

A systematic plan to get item analysis details incorporated is made out and university examinations are set by paper setters making use of the question bank with Table of Specifications, already prepared.

Level D This is the level at which the Association of Indian Universities has undertaken to constitute initial Question Banks in different first degree level subjects. To start with Questions/items were collected from a) specially conducted Question Banking Workshops at various colleges/ universities; b) teachers and item writers from all over India who were trained in Evaluation methods and c) past examination papers of various universities. These questions/ items were prevalidated by groups of teachers and evaluation experts using a checklist of criteria for prevalidation and all technical values are given. Then these questions/items are put on cards (8" x 5") and stored in Kardex trays. These questions/items are also printed in the form of books and made available to universities. Cards in Kardex trays are also available as a system. A systematic 'field trial' will be done and these questions/items that are used in university examinations item analysed. Details of item analysis will be incorporated in these cards.

Forms of Question Banks

Depending upon the levels at which these are built up and also upon the uses to which they are likely to be put, there can be different forms. In its simples form, it can be a file, each question/item, type written and classified into dfferent types in series content topics. It can be in the form of 8" x 5" cards simply carrying one question/item per card and stored. An improved form will be the same 8" x 5" cards with lot of printed columns to enter the various technical values like code number, subject, topic, date of making, type of question, objective tested, level of question, time for answering and marks allotted. At the back of the card there should be provision to enter FV/DI as shown in the specimen card elsewhere given in this Monograph. These can be stored in Kardex trays. In this form this can exist in the Controller's office for use in setting up examination papers. In another form, these questions/items can be coded and stored in the disc pack of the digital computer (about 1,20,000 questions/items can be stored on a single discpack.). Another usual form is to print it as a book adopting two column single space (this can have more number of questions/items per page) giving either all the questions/items or a 20% sample of the total number of questions/items. Usually for purposes of familiarity and practice teachers and students will be given questions/items in the form of a book. Such books one in each of these ten subjects, are being brought out by the AIU, making available to teachers and examiners somewhere around 5000 to 6000 questions/items in every subject.

ASSOCIATION OF INDIAN UNIVERSITIES

QUESTION/ITEM BANK

QUESTION/ITEM CARD

REF. NO.	CLASS	SUBJECT	TOPIC	DATE OF MAKING	TYPE OF QUESTION

OBJECTIVE TESTED	SPECIAL BEHAVIOUR	LEVEL OF QUESTION	TIME FOR ANSWERING	MARKS

QUESTION/ITEM

Front side of the Question/Item card

Main Points of Answer	**Marks to be given for each point**
(a)	(a)
(b)	(b)
(c)	(c)
(d)	(d)

S. No.	FACILITY VALUE	DISCRIMINATION INDEX	NUMBER EXAMINED	YEAR	NUMBER OF ITEMS/ QUESTIONS IN TEST
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Back side of the Question/Item card

SECTION IV

PLAN OF ACTION TO BUILD QUESTION BANKS

PLAN OF ACTION TO BUILD QUESTION BANKS

Banks or pools of different kinds of questions/ items in various subjects can be built up for future use. The question/item bank may be stored with (a) an individual teacher teaching a particular subject in a college at a particular level, (b) a group of teachers in the same college/ institution teaching the same subject to different sections of the students at the same level, (c) a group of colleges under a university and finally (d) a group of universities or all the universities.

The Research Cell of the Association of Indian Universities as a part of its Development Project, undertook to build up initial question banks in 10 first degree level subjects of Mathematics, Physics, Chemistry, Botany, Zoology, History, Geography, Psychology, Commerce and Economics. A comprehensive plan of action was evolved and the project executed in stages with time scheduling. Given below is the entire planning of this development project that has produced nearly 60,000 questions/items all prevalidated and stored in specially designed 8"x5" cards in Kardex trays:

QUESTION BANKING PROJECT

PLANNING

S. No. STAGES

1. STAGE I : DECIDING PATTERN OF QUESTION PAPERS IN THE SUBJECTS

2. STAGE II : COLLECTING QUESTIONS/ITEMS FROM PAST EXAMINATIONS & OTHER TEACHER/ITEM WRITER SOURCES

3. STAGE III : PREPARING DRAFT QUESTIONS/ITEMS THROUGH WORKSHOPS ON QUESTION BANKING IN INDIVIDUAL COLLEGES/ UNIVERSITIES

4. STAGE IV : SCREENING, SELECTING QUESTIONS/ ITEMS AND CONSTITUTING INITIAL BANKS

5. STAGE V : PREPARING QUESTIONS/ITEMS ON SPECIALLY DESIGNED CARDS AND STORING IN KARDEX TRAYS

6. STAGE VI : SAMPLING 20% OF THESE QUESTIONS/ ITEMS RECONSTITUTING INTO CYCLOSTYLED FORMS FOR FIELD TRIAL

7. STAGE VII : FIELD TRIAL OF QUESTIONS/ITEMS THROUGH TEACHERS

8. STAGE VIII : INCORPORATING ITEM/QUESTION BEHAVIOUR CHARACTERISTICS ON CARDS

DESCRIPTION OF TASKS IN STAGES

STAGE I DECIDING PATTERNS OF QUESTION PAPERS IN THE SUBJECTS (MATHEMATICS, PHYSICS, CHEMISTRY, BOTANY, ZOOLOGY, PSYCHOLOGY, HISTORY, GEOGRAPHY, COMMERCE AND ECONOMICS) AT FIRST DEGREE LEVEL

1. Preparing a suggested pattern of question papers with the help of initial work done at Calicut (years ago) and Madras University (recently) by their Boards of Studies and addressing a 20% sample of mainstream universities.

2. Periodically consolidating the replies from these universities.

3. Preparing a summary and conclusive patterns of question papers in these subjects.

4. Deciding on the number and types of questions/items to go into the initial Question Banks in these subjects.

5. Preparing a report of Stage I.

STAGE II - COLLECTING QUESTIONS/ITEMS FROM PAST EXAMINATIONS AND OTHER TEACHER/ITEM WRITER SOURCES

II. A. PAST EXAMINATIONS

1. Preparing a circular letter to all the mainstream universities to send the question papers in these subjects in the last 10 years together with syllabus copies.

2. Consolidating the replies and collecting these question papers.

3. Classifying these questions on a preprepared categorisation (in terms of both content and outcomes).

4. Selecting pools of questions/items from these in individual subjects.

5. Typing out on cards (specially designed 8"x5").

6. Storing these items/questions on cards in Kardex trays.

II. B. ITEM WRITER SOURCES

1. Preparing a list of teachers/item writers in these subjects and writing circular letters to all of them to send as many items/questions as they can within a stipulated time.

2. Consolidating the replies and collecting these questions/items.

3. Classifying these questions on a preprepared categorisation (in terms of both content and outcomes).

4. Selecting pools of questions/items from these, in individual subjects.

5. Typing out on cards (specially designed 8"x5").

6. Storing these items/questions on Kardex steel trays.

STAGE III - PREPARING DRAFT QUESTIONS/ITEMS THROUGH WORKSHOPS ON QUESTION BANKING IN INDIVIDUAL COLLEGES/UNIVERSITIES

1. Preparing a list of colleges/universities in the country eager to conduct Question Banking Project Workshops to produce questions/items in these subjects at the first degree level.

2. Preparing course details/handouts/materials for use during these workshops.

3. Conducting Workshops at various places as in (1) above.

4. Collecting questions/items prepared by participant teachers for use in Question Banks at the Association of Indian Universities.

5. Classifying these questions/items on a preprepared categorisation (in terms of both content and outcomes).

6. Selecting pools of questions/items from these in individual subjects.

7. Typing out on cards (specially designed 8"x5").

8. Storing these questions/items on cards in Kardex Steel Trays.

STAGE IV - SCREENING, SELECTING QUESTIONS/ITEMS AND CONSTITUTING INITIAL BANKS

1. Preparing a draft of questions/items from different sources
   a) past examination papers II A.
   b) from teacher/item writers II B.
   c) from participants in Workshops on Question Banking III.

2. Screening, selecting with the help of a checklist.

   (1) In respect of (a) and (b) above, small groups of 4 to 5 specialists will be invited and asked to go through questions/items and select with the help of a checklist of criteria for good questions/items.

   (2) In respect of (c) above, the participants themselves will be engaged in group discussions to select from among those produced during the Workshops, questions/items that satisfy the checklisted criteria.

STAGE V - PREPARING QUESTIONS/ITEMS ON SPECIALLY DESIGNED CARDS AND STORING IN KARDEX TRAYS

1. Deciding on the design of cards (8"x5"); quotations; finalising order; inviting quotations for Kardex Steel Trays.

2. Obtaining the requisite number of cards for the project/number of Kardex trays to store.

3. Typing out questions/items on cards.

4. Storing them in the Kardex trays.

STAGE VI - SAMPLING 20% OF THESE QUESTIONS/ ITEMS RECONSTITUTING INTO CYCLOSTYLED FORMS FOR FIELD TRIAL

1. Selecting the number of questions/items (random 20% sample).

2. Checking on the coverage of content/outcomes; if possible putting them into Sections (Unit test materials).

3. Cyclostyling these.

4. Assembling in the form of booklets.

STAGE VII - FIELD TRIAL OF QUESTIONS/ ITEMS THROUGH TEACHERS

1. Despatching these booklets with unit test materials to different universities to try out.

2. Performing individual item analysis for FV and DI as and when the formats of performance are received.

3. Consolidating these item analyses

4. Preparing individual and summary data of item analysis of these items.

STAGE VIII - INCORPORATING ITEM/QUESTION BEHAVIOUR CHARACTERISTICS

1. Comparing individual on cards/summary characteristics and analysing.

2. Typing out summary characteristics of FV/DI on these items.

A plan of action to build Question Banks for a university for use in preparing end university examinations was drawn up for use by certain universities wanting such a plan. A few universities (Calicut, Madras, Madurai, Mysore, Gujarat, Calcutta) have already started putting the plan into action. Given below is the Plan of action suggested to and accepted by Madras University, to build up Question Bank in PUC/Undergraduate subjects:

1. The individual Boards of Studies in different subjects in which initial Banks of items/questions are required must decide on the pattern of their examination paper. The pattern will include details like types of questions, time and mark allotment, as decided by the Syndicate in its decision on the reform of the structure of question papers. A typical pattern can be somewhat like this.

Each paper is made up of

Part A Objective type items - 15 to 30 numbers, 15 to 30 minutes and 15 to 30 marks.

Part B Short answer questions - 10 to 15 numbers, 80 to 120 minutes and 40 to 60 marks.

Part C Long answer questions - 1 to 3 numbers, 30 to 90 minutes and 10 to 30 marks.

The pattern can differ from subject to subject. An important feature of this pattern is that compared to present practice, it increases the number of questions to be answered quite significantly. With forty odd questions it is possible to cover the syllabus adequately and to include all of the important objectives which is not possible when students answer only 5 or 6 questions. The general recommendation is that short answer questions and multiple choice questions be used substantially and increasingly and that essay questions be used sparingly.

Long answer questions are useful when the aim is to test the ability of students to express their ideas in appropriate language to develop an argument or a sequence of ideas. Their use is indicated particularly in language examinations where, of course, they should not be overused. For most purposes, other types are more efficient. And with long answer questions, it is difficult to achieve reliable marking.

It is necessary that every effort must be made to train staff and potential paper setters in item writing. Good quality items/questions must be identified and selected by groups of teachers. It is also possible to start question banking projects in individual colleges in different subject areas involving 4 or 5 teachers per subject and train them to produce good quality questions/items in a 10 day Workshop on Question Banking.

2. The Boards of Studies after having decided on the pattern of the paper must further decide about the initial question bank in their subjects. Details like the type and total number of questions/items, modus operandi of going about making these items/questions, storing and using the same for setting examinations papers are to be finalised. It is suggested that the initial question bank must be atleast 20 times as big as one examination paper (i.e. each subject question bank must contain initially 20 long answer questions, 400 short answer questions and 400 multiple choice questions, if the paper consists of 1 long answer question, 20 short answer questions and 20 multiple choice items).

The modus operandi can be somewhat like this :

Available questions/items (those with individual teachers and from past examination papers of the university) can be collected. A group of subject matter specialists together with an evaluation expert can go through these questions/items with a checklist of criteria for good quality questions/items to prevalidate them. Those questions/items that are found satisfactory can be classified and stored on cards for use.

A better and rational procedure (this can be in addition to (a) above) is to get a group of subject teachers to assemble for a Question Banking Workshop to orientate them into areas like objectives, strengths and weaknesses of different types of questions/items and initiate/draw into item writing skills. A draft copy of these questions/items must be given to every teacher participating in this workshop to go back to his/her college and put these questions/items for systematic field trial. Item statistics like Facility Value (FV) and Discrimination Index (DI) must be worked out. A practical possibility will be that a 20% sample (4 long answer questions, 80 short answer questions and 80 multiple choice items) can be cyclostyled and given to teachers/students for practice and familiarity. These items/questions can therefore be analysed for their FV and DI. Over a period of 4 to 5 years, all the items/questions would have been field tested. Every year 10 to 20% items/questions must be added.

In regard to storing the rest of 80% (or all of them) the Controller's office can do this by getting items/questions transferred on to specially designed 8"x5" cards and stored in Kardex trays. Later, even storing in a computer memory disc pack is possible.

d) In regard to using question bank for paper setting the paper setter can be asked to come to the office (university controller) with a Table of Specifications prepared by him/her; items/questions can be selected from the bank and handed over to the controller in a sealed cover.

This way the whole process of making an examination paper is made less time consuming and more effective. To summarise:

STAGE	TARGET	REMARKS
1) Board of Studies Meeting to decide pattern of question papers, decide Modus operandi for question banking	1 day	The Board Members may be initiated into the issues involved in the presence of an evaluation expert
2) Initial Banking with past examination papers and other teacher sources	2 days	Group discussion with a checklist of criteria for prevalidation
3) Question Banking Workshop for teachers (5 to 6 teachers per subject)	10 days	Through lead lectures, illustrations, practice sessions and group discussions, to produce the requisite number of questions/items for the bank
4) Screening, selecting questions and constituting a bank	2 days	Group discussion (A panel of subject experts and a few evaluation experts)
5) Preparing questions/ items on cards and storing in Kardex trays	1 month	Controller's office
6) 20% sample of questions/ items cyclostyling and distributing to individual colleges	1 month	- do -

7) Field Trial of questions/items	1 academic year	Individual teachers
8) Incorporating item behaviour characteristics with the items on cards		

Plan of action for constituting Question Bank in a College

If Question Banking is to be introduced as a part of Examination Reform at the college/institution level, this could assume a slightly different role in terms of the college/institution. One may look at the whole concept of Question/Item Banks in different subjects in various departments as something that will be useful to teachers

a) to make up class tests, assignments, tutorials

b) to post validate questions/items in terms of responses by students to these over a period of time

c) to build up their professional skill in writing different kinds of questions/items

d) to modify their teaching methods and adopt more and more effective methods of teaching/learning

e) to diagnose difficulties in student learning

On the basis of first hand experience working with a good number of colleges (autonomous and others on their way to) and institutions, the following plan of action is suggested for implementation:

Stage I — Meeting of all heads of Departments to discuss the number of subjects to be handled every year, the modus operandi to constitute an initial question/item bank, to decide the pattern of question paper, to decide the number of questions/items in these, to decide the form of question bank, the form of storing, using and making it alive and dynamic

Stage I. 1 day, preferably before vacation.

Stage II — Each Head of Department will discuss with their staff the total involvement of all staff in the process of constituting Question/Item Bank in the subjects decided to be taken up for Banking. Three different sources can be thought of :

a) from past examinations papers and class tests

b) from teachers trained in evaluation previously

c) Question Banking Workshops conducted to train all staff of department

Stage II. a) a week

b) a month or the entire vacation period

c) 10 days at the start of an academic year

Stage III — Prevalidation of questions/items with a checklist of criteria for good quality questions. Separate small groups can go over these questions/items and with the help of the checklist, prevalidate and incorporate changes if any in addition to giving

a) a bibliographical coding

b) the topic area being tested

c) objective being tested

d) time for answering

e) marks to be allotted

f) correct answer or main points of answer

Stage III. 10 days.

Stage IV Typing out on cards (8"x5") and storing in Kardex trays 8"x5" specially designed cards are to be made available as also a Godrej Kardex tray. 1000 cards would cost Rs. 100/- and tray for storing 5000 cards would cost Rs. 500/-.

Stage IV. One month.

Stage V Putting the questions/items on Field trial. This may be done in the form of class tests/assignments/ tutorials. In the case of class tests, the items/ questions are analysed for F. V. and D. I. and these are incorporated in the cards carrying these items. In the case of tutorials/assignments, teachers can use the analysis of results of responses to know about teaching efficiency and learning progress; to make good in teaching as well as to diagnose weaknesses in learning and remedy.

Stage V. one year.

Stage VI Meeting with staff and Head of Department to decide issues of keeping the bank alive and dynamic.

Stage VI. One day preferably at the end of academic year.

Atleast a dozen colleges have already instituted a Question Bank in every department. There are perhaps many more who are on their way to doing so.

AN ALTERNATIVE

PROPOSED OUTLINE FOR TEACHER COLLEGE PARTICITION IN THE PREPARATION AND EVALUATION OF MULTIPLE-CHOICE QUESTIONS/ESSAY QUESTIONS (SHORT & LONG ANSWER) FOR QUESTION BANKING

STAGES	PEOPLE INVOLVED	ASSOCIATED ACTIVITIES
1) Syllabus	1.1 Committee of educational and employer representatives	(a) Training for Question Writers
2) Examination Specification (or blueprint)	2.1 Panel drawn from the above + 'specialists'	To be successful, the system indicated requires continuous participation of teachers. It requires their knowledge, skill and experience for question writing and their cooperation in question evaluation Successful question writers need training and guided experience It is anticipated that the Colleges of Education will contribute towards providing this training
	2.2 Panels of college teachers. Because examination specifications are detailed syllabus interpretations, colleges would be invited to submit their own versions for all or part of a specification	
3) Preparation of Draft Questions (following blueprint)	3.1 College teachers + other 'specialists'	

4) Submission of Draft Questions to examining Board	4.1 College teachers + other 'specialists'
5) Preparation of 'Question-sets for Pre-testing	5.1 Panel as for 2.1
6) Pre-testing of 'Question-sets'	6.1 College teachers
7) Submission of Pre-test data + comments	7.1 College teachers
8) Question Evaluation using field data + comments	8.1 Examination Body (+ Panel as for 2.1)
9) Question 'Banking' i.e. Classification, Recording Evaluation data and Question Storage	9.1 Examining Body
10) Selection of Evaluated Questions for Examination Papers	10.1 Examination Panel (Chief Examiner + advisers)

(b) Syllabus Revision

The preparation of examination specifications and the writing of questions to match specifications provides an excellent means for a detailed systematic inspection helping to identify areas where syllabus wording and syllabus content require amendment. Thus teachers engaged in question writing will also be in an excellent position to forward their views on the syllabus itself.

SECTION V

STORING QUESTIONS/ITEMS

STORING QUESTIONS/ITEMS

Storing questions/items is relatively simple but tremendously important. In a university set up when the Controller of Examinations is to get papersetters in different subjects to select questions/items from a bank of cards in Kardex trays, a certain amount of secrecy is involved. Initially the questions/items can be neatly typewritten on a side of the 8" x 5" card which carries in addition to the question/item, certain details called 'technical values' of the question/item. A sample question/item bank card is shown below. As the number of cards goes on increasing as well as the number of subjects in which question/item banks are built, it becomes increasingly difficult to think in terms of storing in Kardex trays; An enormous extent of space, amount of money and effort are required to maintain and use the banks.

As one might expect, it is when the number of variables comprising the specification or sheer numbers increase then a manual system loses efficiency. A computerized system, in which all the question parameters including statistics are stored on disc, then comes into its own. Computerization also facilitates book-keeping and enables the bank administrators to keep track of what they have got. It may be noted, however, that it will be necessary to retrieve the actual question material from the filing cabinets or wherever it is kept. It is quite feasible to store the text in a computer, costly though it might be; but pictorial material and certain mathematical and chemical symbols are beyond the reach of available technology; certainly on a routine basis.

Questions/items are also stored in the form of brochures and files. These are particularly useful in the hands of teachers involved in continuous internal assessment making up periodical class tests, tutorials, assignments and so on. Also whenever a sample of questions/items of the banks maintained by the university for purposes of end university examinations, is to be tried out for familiarity and practice by teachers and students, a booklet form will be quite useful. A Kardex tray with 4 compartments can easily hold around 5000 cards and the cost of this will work out to Rs.1500/- (Rs. 500 for tray; Rs. 500 for printing cards and Rs. 500 for typing).

SECTION VI

USING QUESTION BANKS

USING QUESTION BANKS

People are often curious about how question banks work. Without going into the nuts and bolts, an attempt will be made to communicate the essential working as it affects the user. First, be wary of anyone who says he has a question bank. As often as not, it will turn out to be a scruffy collection of questions thrown into a filing cabinet, from which choosing questions is like finding bargains in a jumble sale.

Depending upon the form of the question bank, its use will be varied. In the simplest form of a file of typewritten questions/items with an individual teacher, the use may be limited to the class he teaches for making up tests at the end of every lesson or more practically at the end of a few lessons. The teacher then has to sort out the content matter for his test together with the outcomes or objectives he wants to test. He may then decide to have from each content area certain number of items checking recall (knowledge), certain other number of items checking comprehension (translation, interpretation and extrapolation), application etc. He will have to make a choice and constitute his test, administer it to his students and by conducting an item analysis for FV & DI, will be in a position to conclude about his items. It may also be that a brochure containing a certain number of questions/items will give enough details to the teacher-user to select questions/items to make up class tests in certain select content topics for certain abilities needed to be examined. Sometimes the teachers may write to the bank organizers giving their requirements and it is then for the bank organizers to make a choice and build up a test. This will enable a systematic feedback at the bank organization.

A blue print or a Table of specifications needs to be made in a university set up, when papersetters are invited to use the question bank question/items for paper setting. The Table will list the content topics as one dimension and the objectives or abilities like knowledge, understanding, application, analysis, synthesis and evaluation as a second dimension. Total weightages (relative) are to be allotted to each content area depending upon the answers to questions like

1. To what extent an understanding of this area will help understanding other areas in the same subject?
2. To what extent an understanding of this area will help understanding of other areas in other subjects in the course?
3. What is the time spent in instruction in this area?
4. Will the student use much of this area in everyday life?

These total weightages in each area will be distributed to various abilities and a typical table will look like this

Objectives → content ↓	Knowledge	Under-standing	Appli-cation	Skills in computing reading	Total
A	4%	4%	2%	2%	12%
B	6%	8%	8%	-	22%
C	5%	6%	5%	2%	18%
D	8%	10%	10%	-	28%
E	4%	8%	6%	2%	20%
	27%	36%	31%	6%	100%

Looking at the content area A, the breakdown is 4% for knowledge; 4% for understanding; 2% for application and 2% for skills. The papersetter has to simply choose questions/ items in this content area A from the book . Perhaps he can take 2 objective type test items for 2 marks and 1 short answer for 2 marks all checking knowledge; 1 short answer question for 4 marks involving testing comprehension; short answer question for 2 marks checking application and 2 objective type items for 2 marks checkingskills in computing etc.

A further table as given below will help choice of questions/items

Objectives → Content ↓	Knowledge			Understanding			Applieation			Skills		Total
	Obj	SA	LA	Obj.	SA	LA	Obj.	SA	LA	Obj	SA	
A	2	1 (2 marks)	-	-	1 (4 marks)	-	-	1 (2 marks)		2	-	12%
B	4	1 (2 marks)	-	4	2 (2 marks each)	-	2	-	1 (6 marks)	-	-	22%
C	3	1 (2 marks)	-	4	1 (3 marks)		2	1 (3 marks)	-	2	-	18%
D	4	2 (2 marks)	-	4	2 (4 marks)	-	2	-	1 (8 maks)	-	-	28%
E	2	1 (2 marks)	-	3	2 (3 marks , 2 marks(	-	-	-	1 (6 marks)	-	1 (2 marks)	
	15	6		15	8		6	2	3	4	1	

Number of objective type test items = 40
S. A. questions = 17
L. A. questions = 3

Part A	40 items	40 marks	40 minutes
Part B	17 questions	40 marks	95 minutes
Part C	3 questions	20 marks	45 minutes.

Part A is made up of objective type test items and given first to students. They may respond on the question book itself or a separate response sheet be prepared and given. After the completion of Part A, Part B and C will be given for answering. A key to Part A and answers to Part B and C must be prepared before starting correcting scripts.

It is inherent in the working of question/item banks that those questions and items selected and put into a test or examination, must be item analysed for Facility Value and Discrimination Index, considering the performance of students. A detailed procedure for finding out FV and DI is given in the Section VII - Pre and Post Validation of Questions/Items. These values of FV & DI must be entered in the cards carrying these questions/items.

It is also possible that teachers can use the banks of questions/items for making up class tests much on the same lines as outlined above for university examinations. Perhaps a rigorous table of specifications may not be all that necessary for a class test at the end of a few lessons. It is certainly required when a class test is given at the end of a sufficient coverage of topics. An item analysis as above must be carried out and characteristics entered on cards.

After sometime; questions/items (whose F.V.s & DIs are known) can be used out of a Question bank to create criterion referenced tests viz. tests on which a minimum score of 75 to 80% can be fixed. These are items of around that value of F.V. Tests and examinations can be constructed to diagnose weaknesses in learning. Suppose in a content area, the ability to apply oneself is required to be tested and diagnosed for its existence (or absence), then a series of application items in the area (of known FV and DI) can be chosen and made up into a test. Those who return poor scores on this will be diagnosed to lack the ability to apply and the teacher can suggest certain remedial measures. The presence of a good collection of all kinds of questions/items will enable different Boards of Studies and Examiners to increasingly think of restructuring the pattern of their papers. Teachers, examiners and others must imaginatively use the bank to serve different kinds of purposes always remembering the fact that item analysis is intrinsic to the operation and use of the banks.

SECTION VII

PRE AND POST VALIDATION OF QUESTIONS/ITEMS

PRE AND POST VALIDATION OF QUESTIONS/ITEMS

INTRODUCTION

The core of Examination Reform in Higher Education lies in the reform of questions/items. Many of us would agree on this that if questions/items are written by teachers, examiners and others with care in a scientific way, the main problem in reform of examinations is already solved. University teachers have been trained in the art and science of item writing byvarious agencies like UGC, AIACHE and ISTE but such training has neither systematic nor intensive. these teachers have also been trained to prepare blueprints for making their question papers, write questions/items to fit the Table of Specifications or Blueprint and thus build in validity. They have also been prepared to use a variety of selection (objective type) and Supply type questions/items. Many of these (few) trained teachers have not been utilised to prepare university examinations so much so the expertise they had acquired served them only to test their class students. Some of these trained teachers, devoted and committed professionally to their work, assumed leadership role and trained other teachers similarly. Enough has not yet been done to have a real multiplier effect.

A few universities have attempted to train their paper setters/examiners in scientific and rational methods of question paper making, judging the suitability or otherwise of their questions/items. etc. There are many university teachers/examiners who out of their innovativeness are able to create good questions/items but most of them are not aware of systematic prevalidation procedures to make judgement about the quality of questions/items. Boards of paper setters when they want to pass judgement about a particular paper set by an individual paper setter, find it difficult to pass judgement. Teachers and others have to be aware of criteria to judge the quality of different kinds of questions/items preparedby them. This is particularly useful when a college or a university is in the process of constituting initial question banks or pools in various subjects with the help of past examinations, item writers, teachers and participants on specially conducted Question Banking Workshops.

The Research Cell of the AIU launched on a Question Banking Development Project in 10 first degree level subjects of Mathematics, Physics, Chemistry, Botany, Zoology, History, Geography, Psychology, Economics and Commerce, collecting questions/items from three distinct sources of :

a) past examination papers of various universities

b) item writers/teachers specially those trained in the area of examinations.

c) workshops specially conducted for building question banks.

In order to select the questions/items to be retained in the question bank, separate groups for each subject have been constituted. Each group consists normally of two subjects experts and an evaluation expert. Together they do 'prevalidation'.

PREVALIDATION

Prevalidation relates to the activity undertaken by each group towards passing a judgement about the quality of questions/items. In a university set up, Boards of Examiners are appointed in various subjects to review individual question papers prepared by paper setters and such Examiners must be knowledgeable about criteria for judging the quality of questions in respect of validity, reliability and objectivity and so on. Very often the only criteria, seems to be the closeness of agreement of the question paper with the previous ones and very often innovative departures are not encouraged. It is obvious therefore that such Boardsof Examiners must evolve a criteria to judge the quality of questions/items and use them.

The University of Calicut, in its pioneering attempt to constitute question banks in various pre and first degree subjects, tried to help their own teachers with a checklist of criteria for prevalidation of questions/items for question banks and a checklist was prepared and its use was illustrated during a Question Banking Workshop for the 3-year degree course subjects.

CHEKLIST OF CRITERIA FOR PREVALIDATION OF QUESTIONS/ITEMS FOR QUESTION BANKS

CRITERIA TO JUDGE THE QUALITY OF SELECTION TYPE ITEMS

A. GENERAL

1.0 Is the item measuring an important learning outcome?
2.0 Is the item measuring an important content
2.0 area?
3.0 Is the level of difficulty likely to be right?
4.0 Is the item likely to be answered correctly by higher ability students?
5.0 Is the item likely to be answered wrongly by lower ability students?
6.0 Is the item independent or does it overlap with other items?

B. SPECIFIC

(i) Constant Alternative type

1.0 Does the item include only one significant idea in each statement
2.0 Is the statement so precise that it can be judged unequivocally true or false?
3.0 Is the statement short and in simple language?
4.0 Does the item use negative statements sparingly and avoid double negatives?

(ii) Multiple choice/Multiple facet types

1.0 Is the stem concise and unambiguous? Is the negative (if unavoidable) emphasized?
2.0 Is the stem a complete question by itself? Does the item require the student to read the options to discover what is being asked?
3.0 Is the content of the question clear?
4.0 Does the stem include anything that needs to be repeated in every option, within itself?
5.0 Are the options parallel in content?
6.0 Are the options parallel in structure?
7.0 Is the item devoid of any clues such as mix up of singular, plural, precision and length of key option etc.
8.0 Is the key option unarguably correct?
9.0 Are the distractors plausible?
10.0 Does the item exclude "all of these" ?
11.0 Is the language used in the item appropriate to the vocabulary of students at this level?
12.0 Does the item avoid similarity of wording in both stem and the correct answer?
13.0 Does the item exclude responses that are "all inclusive"?
14.0 Does the item use an efficient format?

(iii) Matching

1.0 Does the item include only homogenous material in the "premises"?
2.0 Is the number of responses sufficiently large so that the last of their premises can still have many options to choose from?
3.0 Does the item specify the basis of matching, type of matching, kind of entry etc. ?

CRITERIA TO JUDGE THE QUALITY OR SUPPLY TYPE TEST ITEMS

A. GENERAL

1.0 Is the item measuring an important learning outcome?

2.0 Is the item measuring an important content area?
3.0 Is the level of difficulty likely to be right?
4.0 Is the item likely to be answered correctly by higher ability students?
5.0 Is the item likely to be answered wrongly by lower ability students?
6.0 Is the item independent or does it overlap with other items?

B. SPECIFIC

(i) Simple question/completion

1.0 Is the item so stated that a single, brief answer is possible? (a word, a number or a phrase)
2.0 Is the question direct?
3.0 Is the answer related to the main point in the statement?
4.0 Does the item with the blank spaces make enough sense so that a student knows what to do?
5.0 Does the item in the case of a numerical answer indicate the degree of precision?

(ii) Short answer Questions

1.0 Is the statement of question simple, clear, unambiguous?
2.0 Does the question involve observable, measureable behaviour?
3.0 Is the scope of the answer limited?
4.0 Is the direction given in the question, clear?
5.0 Is the question a valid testing situation for the ability considered?
6.0 Is the question likely to be interpreted in the same way by teachers/students/examiners?
7.0 Is the answer to the question capable of being marked objectively?
8.0 Is the question likely to have the right kind of difficulty value?

9.0 Is the question likely to be answered correctly by many higher ability students?
10.0 Is the question likely to be answered wrongly by many lower ability students?
11.0 Is the question capable of further restructuring?

(iii) Long answer

1.0 In answering this question, in your opinion does the student need to organise his ideas, choose the form of his answer in his own words?
2.0 Does the situation presented in the question seem to be new to most of them?
3.0 Is it possible that students can produce memorised answer to this question?
4.0 Does answering this question involve sort of judgement on the part of students?
5.0 Is the time limit reasonable?
6.0 Is the length and scope of the answer specified?
7.0 Does it avoid usage of very open verbs?

USING THE CHECKLIST

The checklist includes certain general criteria in respect of any type of question/item whether of selection or supply type. The question/item must be measuring an important learning outcome, an important content area; must behaving the right level of difficulty; must be answered by many higher ability students and by a few lower ability students; must not overlap with any other question.

There are specific criteria listed that are peculiar to the item type. For example if the item is a True/False (constant alternative type), we may have to check with the 4 criteria listed under constant alternative, namely (i) whether the item includes only one significant idea in each statement; (ii) whether the statement is so precise that it can be judged unequivocally true or false; (iii) whether the statement is short and in simple language etc. Similarly criteria specific to different types of items/questions are given in the checklist.

It may be necessary to modify an item/question to satisfy some of the criteria. It may happen that some questions/items may have to be completely rewritten; yet some others may have to be rejected totally. Questions/items that have been selected for retention will have to *be coded and referenced in terms of :*

(i) A bibliographical code number to locate it for use in future.

(ii) Subject/topic being tested

(iii) Type of question/item

(iv) Objective being tested (A special coding has been designed ranging from A1, A2, A3...... G2 for all intelectual abilities ranging from simple recall of knowledge through comprehension, application leading to evaluation at the highest cognitive level. The group doing prevalidation must look at the question/item and decide as to what is the highest level of intellectual abilities that the student has to display in order to answer this question/item. If they decide that comprehension interpretation is the highest level of intellectual ability displayed by the student in answering the question/item, a coding C2 will be given to it.

(v) Given below is a system of categorization to be adopted for questions/items :

(A) In terms of content

A bibliographical coding (number for each subject has been prepared. This will form part of Reference No. (Code NO.).

(B) In terms of abilities/outcomes/objectives

The following is the classicication with latter symbols. This will form the other part of Reference No. Code No.).

A1	Knowledge of specifies, terms, specific facts
A2	Knowledge of conventions, trends and sequences, classification and categories, criteria, methodology
A3	Knowledge of universal , abstractions, principles and generalisations, theories and structures
B	Skills of sketching, drawing, computing, reading
C1	Comprehension - Translation
C2	Comprehension - Interpretation
C3	Comprehension - Extrapolation
D1	Application - using information in concrete situations
D2	Application - problem solving (closed as well as open ended)
E1	Analysis of elements and relationships
E2	Analysis of organisation
F1	Production of a set of abstract relation, a plan or of proposed set of operations
G1	Judgement in terms of internal evidence
G2	Judgement in terms of external evidence

Checklist of action oriented verbs for all these Categories

A1	define, describe, identify, lable, match, name, outline, reproduce, select, state,
A2	list, recall, detect mistakes, give classifications, name trends, list sequences,
A3	recognize
B	sketch,

B sketch, draw, compute, find, calculate, read chart, use chart, draw graph, use graph, use tables, show by calculation, select table

C1 define in own words, convert, distinguish, compare, estimate, explain in own words, estend, give examples, infer, predict, rewrite,

C2 interpret, manipulate, translate, verify, discriminate, classify, construct, extrapolate, estimate future consequences, prepare,

C3 represent, restate, rephrase, change, reorder, rearrange

D1 compute, demonstrate, modify, change, find, calculate, prepare, produce, solve, show,

D2 use, establish, verify, apply to solve a problem, construct chart, graph

E1 break down, differentiate, discriminate, distinguish, illustrate, outline, point out, relate, select, separate, subdivide, recognise

E2 find, relationship, establish relationship, state, unstated assumptions, recognize logical fallacies, deduce, contrast, compare, derive

F1 categorize, combine, compile, compose, create, devise, design, explain, generate, organise, plan, rearrange, reconstruct, relate,

F2 reorganize, revise, rewrite, summarise formulate, generalise, write a theme, conclude, constitute, transmit, modify, document specify, derive

G1 appraise, compare, conclude, decide, constrast, criticise, discriminate, justify, relate, support, draw inference, judge adequacy, predict.

(v) Time for answering a selection type item; each item is usually given a minute. Sometimes to make the total test of 100 items (Multiple choice), 80 to 90 minutes, alone would be given to make it speeded test for all those taking the test.

(vi) Marks to be allotted: 1 mark is to begiven for every objective item. Anything between 3 to 6 marks to be given for short answer questions, anything between 6 marks and 16 marks may be given for long answer essay questions/problem solving questions.

PREVALIDATED SAMPLE OF QUESTIONS/ITEMS

Some samples of prevalidated questions/items for these areas at first degree level are given to make it clear.

(1) Mathematics

Item The tangent at the point (2, 2) on the curve

$Y = X^3 - 12X + 18$ is

(a) Passing through the origin
(b) Parallel to the X-axis
(c) Parallel to the Y-axis
(d) Cutting equal intercapts in the X and Y-axis

(i) Bibliographical Code No. is 516.36
(ii) Subject Geometry Topic Tangents, Normals to curves
(iii) Multiple Choice
(iv) Objective tested: application-problem solving D2 Time for answering : 1 mt.
(v) Time for answering :1 minute
(vi) Marks: 1

Ref. No.	Class	Subject	Topic	Type of Question/item
516.36	First degree	Geometry	Tangent & Normal	Multiple Choice

Objective tested	Level of Question	Timefor answering	Marks allotted
D2	First degree	1 min.	1

(2) Physics

Item

A metal owes its magnetism to an orderly arrangement of relatively large units (called 'domains') each composed of thousands of atoms. In a magnetized material, these domains may be compared to tiny magnets all pointing in the same direction.

For each statement use (a) if it is supported by the principle
(b) if it is contradicted by the principle
(c) if it is neither supported nor contradicted by the principle .

(1) A current of electricity flowing in a nearby wire cannot cause a bar of metal to become magnetic

(2) A hot bar of iron is harder to magnetize than a cold bar

(3) The best conductors are also capable of the strongest magnetization

Ref. No.	Class	Subject	Topic	Type of Question/Item
	First degree	Physics	Magnetism	Multiple facet

Objective tested	Level of Question	Time for answering	Marks alloted
D2	First degree	3 mins	3

(3) Chemistry

Item

If hydrogen sulphide is bubbled through an acidified solution of potassium dichromate, the solution turns bright green with an yellow precipitate.

True	False	Don't know
☐	☐	☐

Ref. No.	Class	Subject	Topic	Type of question/ item
	First degree	Chemistry	Analysis	Constant alternative

Objective tested	Level of Question	Time for answering	Marks allotted
C2	First degree	1 mint.	1

(4) Botany

Item

Use the following key and answer the item below:

Key A) Both statement and reason are true
B) Statement is true but reason is false
C) Statement is false but reason is correct
D) Both reason and statement are false *

1. Capparidae is not regarded to be advanced over Rannales because it has got difinite number of floral parts arranged in a cyclic manner

2. The plants belonging to the family Apocyana case show anamalous type of secondary thickening because of the occurrance of spicular cells in the plant parts

3. The family Nymphaceae is regarded as primitive because of the equatic habit of the planets

Ref. No.	Class	Subject	Topic	Type of question
583.0	First degree	Botany	Taxonomy	Multiple Facet

Objective tested	Time for answering	Marks allotted
C1	3 mints.	3

(5) Zoology

Item

Check the most appropriate answer. In an experiment the sponge is sequeezed through silk bolting cloth in appropriate medium and allowed to stand. For what purpose is this experiment perfomed?

To prove that

a) the sponges are multicellular
b) the cells are loosely arranged and cell relations can be disrupted
c) the cells are so small that they can be squeezed through cloth
d) the sponges are nonliving

Ref. No.	Class	Subject	Topic	Type of question
593.4	I B.Sc.	Zoology	Organization	Multiple choice

Objective tested	Time for answering	Marks allotted
D1	1 mint.	1

(6) Economics

Item The basic determinant of changes in the quantity supplied of a product is

Key
A) Technological advance
B) Prices of the resources used in the production of the product
C) Price of the product
D) Expectations concerning the future price of the product

Ref:No.	Class	Subject	Topic	Type of question/item
338.5213	First degree	Economics	Price-supply relationship	Multiple Choice

Objective tested	time for answering	Marks allotted
A1	1 min.	1 mark

(7) Commerce

Item The combination in which one management acquires the control over different successive stages in *production in one industry is called*

Key
A) Vertical
B) Horizontal
C) Circular
D) Lateral

Ref/No.	Class	Subject	Topic	Type of question/item
658.5	First degree	Commerce	Management of production	Multiple choice

Objective tested	Time for answering	Marks allotted
A1	1 min	1 mark

(8) Psychology

Item The purpose of theory in Psychology is

Key
A) *to guide experiments*
B) to integrate and predict
C) to explain new events in a field
D) to offer detailed explaination of definitions

Ref. No.	Class	Subject	Topic	Type of question/item
150	First Degree	Psychology	General Psychology	Multiple Choice

Objective tested	Time for answering	Marks allotted
F2	1 min	1 mark

POST VALIDATION

Post validation refers to a systematic analysis of items/questions for two important characteristics, namely 'item facility' and 'item discrimination index'. There are very rigorous statistical procedures developed for analysing accurately various items/questions contained in a test. At the same time there are certain simple methods developed for analysing items/questions and these methods yield fairly accurate values which are for all practical purposes adequate for a classroom teacher and for a university Board. There are techniques developed both for objective type items as well for subjective type questions. These are presented under item analysis here.

ITEM ANALYSIS

The most interesting, challenging and rewarding part of test analysis is the item analysis. It is through item analysis

a) that a teacher learns most about himself as a teacher
b) that a teacher learns what his students have (or have not) learned
c) that a teacher knows his skill as an examiner
d) that a teacher can improve hisown item writing skill very rapidly.

It is the purpose of item analysis to tell us about each item in our test two things :-

1) How easy or difficult is the item? How many students answered it right?
2) Is the item measuring the same thing as the rest of the test? Does it discriminate between the good and weak students?

The response sheets of students on an objective type test are all collected and marked. One can do edge marking or one can prepare a matrix of performance in a format specially designed with item numbers and student Register

Numbers with a scheme that if an item is answered right by a student, then there will be an entry of 1 and if an item is answered wrong by another student, there will be an entry of 0. This is repeated for all items and for all students.

A key with answers to all items is prepared and with the help of this marking could have been done. Even a computer can be used. This is particularly advantageous when we deal with a great number of students on a test with a good number of items.

Their marked answer response sheets are arranged in the order of merit; count of the total number of students who took the test at 27% of this is to be worked out (why 27%) There are good and valid statistical reasons for this; If the biserial calculated from the extremes of a distribution, the standard error of this biserial is at a minimum when the two tails contain 27% of the cases each (Guilford 1954, Harper 1965)..

FACILITY VALUE

The facility value or facility index of an item is the percentage of students who answered the item right. If we call the upper and lower groups to be fairly indicativeof the total performance, then

$$FV = \frac{\text{Total rights in upper and lower groups}}{2 \times \text{no. in each group}}$$

Simply, one has to count the students who got 1 for the item in the upper and lower groups but together and work out the percentage of the total

FV can range from 0 to 100%

Number right in the upper group and divide by number of either group. In formula from DI=(Facility of upper group)-(Facility of lower group) DI is expected as a decimal value. Its range is possible from -1.00 to + 1.00.

Meaning of the D.I.

a) at trial test stage

-1.00 through 0.0 to + 0.20	No significant discrimination: item not related to the test as a whole. Upper sample not doing better on the item than the lower sample; modify or reject
+ 0.2 to + 1.00	Good positive discrimination

b) after trial test: **In** use:-

-1.00 to -0.25	Weaker students have a better grasp of the topic than better students.
-0.25 to +0.25	All students' knowledge of the topic is equal
+0.25 to +1.00	Too high a positive discrimination, will mean that 'gap' between better students and poorer students may be too great. Remedial work for poorer students may be required.

Use in test construction

1. Items with known discrimination indices may be used to generate a test with a required spread of marks. Using items with low DIS will produce a small spread in marks; items with high DIS will produce a larger spread of marks (and therefore perhaps more failures and/or more distinctions).

2. Items with known discrimination indices may be used to produce a test which has weak discrimination on

   earlier items, the discrimination in favour of better students increasing through the test.

3. Discrimination indices may be used to locate those topics which all students will learn; and those topics which favour those students who otherwise are not doing well.

Tables I and II show the performance matrix of the upper ability and lower ability groups of students (27% of 44 students = 12 students) in both a 20 item objective type test as well as a test of 10 short answer questions.

Facility values of each of these 20 items will be calculated by finding the total for every item of all the upper ability 12 students and the total for every item of all the lower ability 12 students and dividing the sum of the two totals by 24. For example item (1) has 12 from upper ability and 11 from lower ability 12 thus a total of 23 out of 24

$$\text{F.V.} = \frac{23}{24} \times 100 = 95.83\%$$

F.V. of upper ability group is $\frac{12}{12} \times 100 = 100\%$

F.V. of lower ability group is $\frac{11}{12} \times 100 = 91.67\%$

F.V. of the total $= \frac{100+91.67}{2} = 95.83$

D.I. of the same item is $(\frac{12}{12} - \frac{11}{12}) = \frac{1}{12} = 0.082$

Facility values of each of these 10 questions of 5 marks each will be calculated as under.

Find the total marks obtained by all the upper ability 12 on any question and divide this total by the maximum possible total for that question by all 12 students. This will give the facility of the upper group. For the first question this is $\frac{60}{60} = 100\%$. Let us do this with the 12 lower ability. This is $\frac{30}{60} \times 100 = 50\%$. F.V. of the whole group $= \frac{100+50}{2} = 75\%$ D.I. $= \frac{100-50}{100} = 0.50.$

Standards prescribed for good items/questions.

F.V. for both objective and short answer, long answer etc. must range from 20% to 80%.

D.I. for objective type items **0.2 to 0.6**

0.6 Excellent item
0 to 0.2 needs improvement
0 to be discarded

D.I. for short answer/long answer 0.5 (acceptable)

0.3 to 0.5 needs improvement
0.3 to be discarded

Meaning of F.V.

a) At trial test stage

0.0 to 25% item too hard modify (check distractor)
25% to 75% item of correct facility.
75% to 100% item too easy reward or reject (check for clues)

b) after trial test: i.e., in use:

0 to 25% topic not taught well/not learnt well (check teaching techniques)

25 to 75% topic reason ably well taught/leanrt well
75 to 100% exceptionally good knowledge of topic.

Use in test construction:

1. Items with known Facility values can be used to design a test with a predictable difficulty.

2. Items with known Facility Values can be used to design a test which starts with "easy" items and progresses to "harder" items.

3. Facility Vaoues give a quantitative measure of the learning of the topic and ability tested by the item.

4. Facility Values allow different groups of students to be compared, topic by topic on a subject they are all studying (eg. College performance with National or Regional performance or this year's students with last year's students).

5. Putting tests together from a pool of items with known Facility values enables "Standards" to be defined and maintained between courses or over the years for a given course. Recommended facility = 20% to 80% (25% and 85% Paul Diederich) Average facility of all items = 50%.

Precision of measurement isgreatest when all of the items in a test are about equally difficult for the group tested, that maximum reliability and dispersion of scores could be attained if every item (M-C test item) is answered correctly by somewhere between 60% to 70% of students (Paul Diederich 1960). Ebel has shown in hisbook(p. 363) that the wider the distribution of item facility the narrower will be distribution of test scores. The ablest students are those who can answer the largest number of items of average difficulty (Harper).

DISCRIMINATION INDEX

How well the item is able to discriminate between higher ability students? Even though there are 60 different item analysis methods (Males, 1972), it turns out that one of the simplest is also one of the best for ordinary use. This is Johnson's upper-lower index (Johnson 1951). Its calculation is really simplicity itself. You substract the number right in the lower group from the number right of the upper group

DISCRIMINATION INDEX (DI)	FACILITY VALUE %		
	Below 40%	40 to 60%	Above 60%
Above 0.40	Difficult*	Accpetable*	Easy*
0.30 to 0.39	Difficult	Improvable	Easy
0.20 to 0.20	Difficult	Marginal	Easy
0.20	Rejected	Rejected	Rejected

* Acceptable for a test

In general very easy and very difficult items have poor discrimination and too many of these would have a serious effect on the reliability and validity of the test.

Further points

1. Facility valuesand discrimination indices will have most meaning at the pretest stage if the pretest form is administered to a sample of a respectable number of average (or typical) students.
2. The two basic item statistics should always be recorded with the item along with details of the pretest sample if item banking (i.e. reuse of items) is to be undertaken.
3. Computer programmes are increasingly available so that this analysis could be in a few minutes. In addition to the programme, the computer will require the student selections (a, c, c, d etc.) either copied on to punched tape, punchedcards or a teletype or directly read by a mark sensing device.

Effectiveness of Distractor

Illustration:

1.	Choice	A	B*	C	D
	Upper 18	1	10	3	4
	Lower 18	1	4	6	7

Key has positive Discrimination C&D distractors are () A needs to be looked at.

2.	Choice	A	B*	C	D*
	Upper 18	7	2	1	8
	Lower 18	2	7	4	5

Keyed answer has positive discrimination
B & C Distractor are functioning well.
A distractor has positive discrimination
(A must be revised)

3.	Choice	A	B	C	D
	Upper 18	3	4	6	5
	Lower 18	2	6	3	7

Key has negative discrimination.
A & C Distractors have positive discrimination (They have to be revised) D is O.K.

4.	Choice	A	B	C	D*
	Upper 18	2	3	10	3
	Lower 18	4	5	3	6

Key has negative discrimination.
C Distractor has positive discrimination
A & B Distractors are alright.

Wording of C & D will have to be looked into. May be D is wrongly keyed.

5.	Choice	A	B	C	D
	Upper 18	16	1	1	0
	Lower 18	15	2	1	0

Item too easy to discriminate

Summary

There are very many sophisticated "sample free" techniques for finding FV & DI that have been developed (Willmott Research in Education, May 1975).

Since a relatively small number of students is involved in classroom tests, item analysis results are to be interpreted with great caution. FV and DI calculated on the basis given above will be subject to sampling instability i.e. they will vary from one group to another. We can however favour items at 50% FVor around and those with the highest discrimination index.

If an item:

a) Provides positive discrimination (0.20 and above)
b) alternatives function very well
c) measures a significant objective

it should be retained or placedin a file or Bank. It is better to analyse the item everytime it is used and study. This will clearly show if the item has been more or less consistant or showing variability in indices.

Those who are interested in knowing more about this, are invited to correspond with the Project Officer (Examinations), AIU who will be extremely glad to help.

FOLLOW UP & FUTURE WORK

It is hoped that teachers, examiners and others, initiated into the science of item writing/question making and prevalidation of these questions will in future be engagedin similar activities of item writing, prevalidation and post validation. Each one of them is a professional activity, associated withteaching. At the same time, these personscan assume leadership functions and train a good number of colleagues in their own institution, thus producing a multiplier effect. This is perhaps the only way in our country to train a great number of teachers and examiners in a short time with less financial commitment.

CONCLUSIONS

It is vital that all teachers engaged in university teaching are trained in the science of item writing/question making. A scheme by which a group of leaders can be thoroughly trained andwith the help of secondary training programmes by these leaders in their own colleges/universities/institutions, is proposed on the basis of experience gained in working out such a scheme with some universities in the country. It is also equally important that teachers, examiners and other must be trained in prevalidation and post validation of questions/items so that they will be able to make useful and meaningful inferences about 'their own questions/items.

TABLE - 1

CLASS STRENGTH-44

20 ITEMS TEST
20 minutes
20 MARKS

Item No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTAL
Student No.	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
2	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	19
3	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	18
4	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	18
5	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	18
6	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	17
7	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	17
8	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	17
9	1	1	0	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	0	16
10	1	1	1	0	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	0	16
11	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	16
12	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	16
Total	12	12	7	9	12	12	12	11	12	12	5	12	12	6	12	12	8	12	11	6	
Facility Value	100%	100%	58.33%	75%	100%	100%	100%	91.67%	100%	100%	41.67%	100%	100%	50%	100%	100%	66.67%	100%	91.67%	50%	

CLASS STRENGTH - 44

LOWER ABILITY GROUP = 27% of 44=12 STUDENTS

20 ITEMSTEST
20 MTS
20 MARKS

Item No. Student No.	1	2	3.	4	5	6	7	8	9	10	11	12	13	14	15	16.	17	18	19	20	Total
33	1	1	0	1	0	1	1	0	1	0	1	0	1	1	0	0	1	0	0	0	10
34	1	1	0	1	1	0	1	0	1	0	1	0	0	1	1	0	0	1	0	0	10
35	1	1	0	0	0	0	1	1	1	0	0	0	1	1	0	0	1	0	0	1	9
36	1	1	0	0	0	1	1	1	1	0	1	0	1	1	0	0	0	0	0	0	9
37	1	1	0	0	0	1	1	1	1	0	0	0	1	0	1	0	0	0	0	0	8
38	1	1	0	0	0	1	1	0	0	0	1	1	1	0	0	1	0	0	0	0	8
39	1	1	0	0	1	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	8
40	1	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	0	0	0	7
41	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	1	0	0	0	7
42	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	6
43	1	1	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	6
44	1	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	5
TOTAL	11	10	1	4	4	4	7	3	6	4	7	3	7	5	4	3	4	3	1	1	
Facility Value	91.67	83.33	8.33	33.33	33.33	33.33	58.33	25.00	50.00	33.33	58.33	25.00	58.33	41.67	33.33	25.00	33.33	25.00	8.33	8.33	
Facility Value of the item as a whole	95.83	91.66	33.33	54.16	66.67	66.67	79.16	58.33	75.00	66.67	50.00	62.50	79.16	45.83	66.67	62.00	50.00	62.50	50.00	29.16	
Discrimination Index of the Item	0.083	0.167	0 500	0.416	0.667	0.667	0.416	0.666	0.500	0.667	0.166	0.750	0.416	0.083	0.667	0.750	0.333	0.750	0.883	0.416	

UPPER ABILITY GROUP =27% of 44=12 STUDENTS

CLASS STRENGTH-44

20 QNS TEST
1½ HOURS
50 MARKS
Each question carries five marks(maximum)

Question No. Student No.	1	2	3	4	5	6	7	8	9	10	Total
1	5	5	5	4	3	5	5	5	5	5	47
2	5	5	4	3	4	5	5	5	5	5	46
3	5	5	4	3	3	5	5	5	5	5	45
4	5	5	4	4	4	4	5	4	5	5	45
5	5	5	3	4	4	4	5	4	5	5	44
6	5	5	4	4	3	4	4	5	5	5	44
7	5	4	4	3	4	5	3	5	5	5	43
8	5	4	4	3	4	5	5	4	4	4	42
9	5	3	4	4	3	2	5	5	5	5	41
10	5	4	4	4	3	3	5	4	4	4	40
11	5	4	4	5	4	4	4	3	3	3	38
12	5	4	4	4	4	3	3	4	3	3	47
TOTAL	60	53	48	45	43	48	54	53	54	54	
Facility Value	100.00	88.33	80.00	75.00	71.66	80.00	90.00	88.33	90.00	99.00	

LOWER ABILITY GROUP-27% of 44=12 STUDENTS

CLASS STRENGTH-44

10 QNS TEST
1½ hours
50 MARKS
Each Questioncarries
five marks (maximum)

Question No. →	1	2	3	4	5	6	7	8	9	10	Total
Student No.											
33	3	3	2	2	3	2	2	3	2	2	24
34	3	3	3	2	4	2	2	3	2	1	24
35	3	2	-	2	4	2	2	3	2	2	22
36	3	1	2	2	3	2	2	2	2	2	21
37	3	1	2	1	3	2	2	2	2	2	20
38	3	1	1	1	3	2	2	2	2	2	19
39	2	2	1	1	2	2	2	2	2	2	18
40	2	2	2	2	1	2	2	2	1	1	17
41	2	1	2	1	2	1	1	2	2	2	16
42	3	-	2	2	1	1	2	1	1	1	14
43	2	1	-	2	1	1	1	2	1	1	12
44	1	1	-	1	2	1	2	1	1	0	10
TOTAL	30	18	17	19	29	20	22	25	19	18	
Facility value	50.00		30.00	28.33	31.66	48.33	33.33	36.67	41.67	31.66	30.00
Facility value of the item as a whole	75.00		59.67	54.16	53.33	60.00	56.67	67.33	65.00	60.83	60.00
Discrimination Index	0.50		0.583	0.516	0.433	0.233	0.467	0.536	0.466	0.583	0.600

SECTION VIII

FUTURE OF QUESTION BANKS

FUTURE OF QUESTION BANKS

Question Banking remains in the category of promising ideas. A few developments could change this situation. Universities/examining boards could join together, pool resources so that teachers could begin to request, more vociferously than in the past, access, to bank of questions/items for the purpose of classroom testing and continuous assessment. Some universities have already built up question banks which they could put at the disposal of teachers. The AIU has developed nearly 60,000 questions/items in 10 subjects (Mathematics, Chemistry, Physics, Botany, Zoology, History, Psychology, Geography, Economics and Commerce) at the first degree level and can make them available either in the form of cards in Kardex trays as a system or in the form of booklets in A4 size double column single space arrangement. At the same time nothing must stop local groups of teachers banding together immediately to form their own question banks using their own and other materials. It is also proposed to take up other popular subjects at the First degree level in future. It is firmly believed that item/question banking is the examining system of future. It is also felt that a few large universities can try this out and make their experiences available to all others.

The question of the cost of item question banking in comparison with other systems of examining and achieving comparability isan important one. At an initial level, the rationalizing effect of question banking would seem bound to make it the cheapest examining method of all. Yet we are unable to demonstrate these advantages simply because no comparison of the cost effectiveness of the various examining and comparability procedures has been worked out. Some idea of the relative costs can be obtained by totalling what it currently costs to examine candidates in say these ten subjects every year. To this can be added the amount which the Boards and/or universities pay either to have an effective cross moderating network or to continue with annual monitoring exercises. It will be surprising if question banks in these subjects cannot be operated for considerably less than this amount.

Plans of action for setting up question banks in individual universities have been given elsewhere. Some universities have launched upon this; others are on their way to. The function of the AIU is to coordinate these efforts and also institute initial fairly large questions/items banks in more popular first degree level subjects and make them available to all universities in the country. However, the future of question banks in this country at the level of higher education depends to a very large extent on the awareness and understanding of a system of question bank on the part of administrators, Boards of Studies members, examiners and teachers. There is no doubt that this will be successful over a period of time since there is sample evidence to showthat individual universities/colleges/other organisations are keen and enthusiastic to develop question bank in many subjects. Thus question bank will make a potential contribution and add a new dimension to the process of examining in higher education.

SECTION X

BIBLIOGRAPHY OF QUESTION BANKING

BIBLIOGRAPHY ON QUESTION BANKING

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